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A Joint Idea

An Antisubmarine Warfare Approach to Theater Missile Defense

JAMES J. WIRTZ

THIS ARTICLE BRIEFLY describes how the philosophy that guides the US Navy's antisubmarine warfare (ASW) operations can be used to organize a theater missile defense campaign (TMD). It treats TMD as a fundamentally joint operation and describes how this ASW philosophy can integrate service capabilities into an extremely effective defense against the ballistic missile threat. To support this argument, the article briefly

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sketches the fundamentals of ASW operations and applies them to the problem of locating and destroying mobile missiles before they can be launched. It then explains why each of the services should play a role in a TMD strategy inspired by ASW. It also suggests which commander in chief (CINC) should take at least peacetime responsibility for promoting the TMD effort. The article concludes with some observations about the role of ideas in joint warfare.

During the Gulf War, it became increasingly apparent that US forces had failed to destroy Iraqi Scuds on the ground before they could be launched against targets in Israel and Saudi Arabia. Despite the large number of air sorties devoted to eliminating the Scud threat, the "flaming datum" used to target mobile missile launchers proved ineffective. Even though aircraft arrived in the general vicinity of a missile site only a few minutes after a missile launch, Scud crews had plenty of time to "scoot" to predetermined hiding areas before US warplanes arrived overhead.

Since the Gulf conflict, improving the ability of American units to defend themselves against ballistic missiles has remained a priority. The Clinton administration's counterproliferation policy emphasizes theater missile defense, especially defense against missiles armed with weapons of mass destruction (WMD).[1] The administration has concentrated on developing active defenses such as upgrading the Army's Patriot missile system and improving command, control, communications, and intelligence (C^3I) to counter the regional missile threat.[2] Still, improved active defenses and C^3I are only two facets of effective TMD. To succeed, TMD requires both passive defenses and a counterforce capability.[3] Somehow, the services must improve the performance turned in against Iraqi Scuds during the Gulf War by integrating the four major elements of TMD—C^3I, active defenses, passive defense, and counterforce—into an overall campaign strategy.

Many political issues complicate counterproliferation and TMD.[4] Devising a joint approach to C^3I and multiservice air, ground, and naval operations, however, poses its own unique set of military problems. In terms of organization and doctrine, TMD is difficult because it is "inherently a joint mission." As the authors of JP3--01.5, *Doctrine for Joint Theater Missile Defense*, note, "Joint force components supporting CINCs and multinational force TMD capabilities must be integrated toward the common objective of neutralizing or destroying the enemy's theater missile capability."[5] Accomplishing this integration, however, is no small task. New hardware, software, or a single new weapon will not miraculously solve the TMD problem. What is needed is a "better idea" for organizing multiservice C^3I, active defenses, passive defense, and counterforce into an effective TMD strategy.

A tried and true method of destroying targets that rely on mobility and stealth to improve their survivability already exists: antisubmarine warfare.

If one is willing to look for this organizing principle in unexpected places, then a tried and true method of destroying targets that rely on mobility and stealth to improve their survivability already exists: antisubmarine warfare. As strange as it may sound, a TMD architecture based on an ASW philosophy offers a way to integrate the services' various capabilities into a coherent plan to stop an opponent's ballistic missiles from reaching their targets. Applying ASW principles to TMD also represents a novel development in joint warfare. Joint strategy can be achieved by using one service's approach to solving a specific problem as an integrating principle in a multiservice op-

As the service operating the only demonstrated active defense—the Patriot missile system—against ballistic missiles, the Army has an obvious role to play in TMD.

eration. In this case, an ASW approach allows each of the services to integrate what they do best into an overall joint campaign.

To support this argument, this article briefly sketches the fundamentals of ASW operations and applies them to the problem of locating and destroying mobile missiles before they can be launched. It then explains why each of the services should play a role in a TMD strategy inspired by ASW. It also suggests which CINC should take at least peacetime responsibility for promoting the TMD effort. The article concludes with some observations about the role of ideas in joint warfare.

Antisubmarine Warfare

At first glance, it would seem easier to find a needle in a haystack than to locate a submarine in the ocean's vast expanse. But the US Navy can detect, track, target, and destroy submarines as they operate in the open ocean. In theory, the same ASW philosophy used to organize and prosecute attacks against submarines should prove to be effective against missile launchers that also rely on mobility and stealth to improve their prelaunch and postlaunch survivability.

ASW procedures are often divided into five categories: (1) continuous collection and analysis of intelligence; (2) continuous monitoring of probable launch areas; (3) generation of cueing (warning) when specific platforms move to a launch status; (4) the localization of specific systems; and (5) attack. Organized sequentially, each of these categories represents a stage in the ASW search and attack effort. As one moves from stage one to stage five, not only does the area searched become increasingly restricted, but the time available to complete the task at hand becomes more limited. These five stages could form the core elements of a multiservice, multimission ASW approach to counterforce strikes against theater ballistic missiles.

Information, critical to the entire counterforce effort, can be gained through sustained collection and analysis of data about all known mobile missiles, the first stage of the ASW process. In tracking submarines, the opponent's inventory is followed by hull number. Similar efforts would have to be made to track individual missile transporter--erector--launchers (TEL). Missile production, storage, and repair centers would have to be monitored to generate this order--of--battle intelligence. This fundamental intelligence work probably would provide the added benefit of uncovering clandestine installations in the opponent's fixed--missile infrastructure. This should produce information about the overall size, day--to--day readiness, and surge (alert--generation) capability of the opponent's systems. Training cycles, exercises, support vehicle activity, base egress and ingress, and movement through “choke points” (well--maintained roads, heavy--duty bridges, rail heads) would also be monitored. These efforts should yield a useful estimate of the general location of the opponent's mobile missiles, creating a baseline to assess deviation in the opponent's standard operating procedures. In effect, stage one creates an indications and warning baseline.

Because it does not rely on “flaming datum”—an actual missile firing—to locate an opponent's weapon, an ASW--inspired strategy probably is the most effective approach to counterforce.

Surveillance of all probable launch areas, the second step in the ASW process, depends upon intelligence gathered about the opponent's overall missile capability: indications of when and where to look for mobile

missiles are produced in stage one analyses. In stage two operations, visual signatures of areas of interest would be compared on a regular basis to look for changes (damage to plants, tire tracks or the presence of the weapons systems themselves). Similarly, acoustic, seismic, radar, and communication signatures could be compared over time. Of special importance would be "life--support events," the logistical tail that could lead directly to a TEL in the field. Special attention would be paid to likely operating areas and negative search information (indications that terrain features make certain areas unsuitable for Scud operations) would be used to develop an operating history of the opponent's TELs. This information could allow real--time "tracks" of fielded TELs to be monitored as long as possible; thus, a working knowledge of the location of all TELs in or near launch areas could be maintained.

Unlike their Air Force counterparts, naval aviators tend not to think in terms of strategic bombardment, but in terms of destroying specific military targets.

Cueing, the third step in the ASW process, is characterized by intensive efforts to develop a more accurate and detailed track of a specific weapons system. It typically results when a TEL is detected in a launch area or when changes in activities or activity levels indicate that preparations are under way for an actual missile launch. This intelligence could come from a variety of sources. Stage one analyses might yield indications of changes in activity or the general location of a specific system. Stage two surveillance also might detect communication, acoustic, or radiation signatures as TELs are made ready to fire. Cueing, however, is best viewed as a transitional step in counterforce efforts against mobile missiles; it is related to a decision by either US authorities or the opponent to move to a war footing. Cueing is intended to establish a detailed track of a potential target, information that would allow for the quick prosecution of an attack.

The decision to engage in the localization (identification of the target's precise location) of cued TELs, the fourth stage of the counterforce operation, will likely be made by the National Command Authorities. Although search activities related to cueing might require overflights of an opponent's territory, localization will require armed aircraft or unmanned airborne vehicles to enter an opponent's airspace, an act of war. Piloted aircraft working to localize an opponent's TELs should possess a defense--suppression capability. Localization begins from a starting point identified by intelligence collected and analyzed from the preceding three stages of the ASW process; because of the short ranges involved, a wide variety of sensors can then be used to generate timely and detailed tracks of the target. Coordination of the platforms involved and fusion (receiving, analyzing, and displaying) of the data produced by a variety of sensors play a crucial role in localizing the target.

Over the years, the Navy also has discovered that practice facilitates localization efforts. The Navy was fortunate because the Soviets had for years provided opportunities to localize real targets on the open ocean. In other words, officers and policy makers cannot expect that the skills, experience, hardware, and communication architectures (fusion) necessary to localize a target can be improvised at a moment's notice.[6]

The final step in the ASW process is to attack the target. Ideally, the attacking weapons system would have its own localization sensor. The Navy never carried out this final step during the cold war, but exercises revealed that coordination and practice increased the likelihood of successful attacks. It would also be important following an attack to verify that the opponent's weapons system

had been destroyed. Crippled systems could be repaired and subsequently fired. This would be especially important if the mobile missiles under attack were armed with WMD. Ground forces would have to be inserted deep behind enemy lines to survey damaged sites or launch vehicles. These forces should be instructed to secure and remove intact warheads or to assess the extent of biological, chemical, or nuclear hazards created by successful counterforce strikes. Even though damaged warheads and delivery systems are not militarily valuable, the hazardous materials they contain would still be valuable to terrorists or to enterprising criminals interested in making windfall profits on the black market. Indeed, given the extreme political sensitivity created by the threat of WMD attack, American political leaders will probably expect total certainty when it comes to damage assessments of WMD sites, the kind of certainty that has historically required the presence of ground forces.[7]

In sum, several aspects of an ASW approach to counterforce make it attractive as a framework for the destruction of TELs before missile launch. An ASW approach calls for continuous monitoring of the status and activities of an opponent's military forces. This would not only build order--of--battle and infrastructure intelligence, but it would also provide a basis for indications and warning estimates. An ASW approach also increases the defensive problem confronted by the opponent. Instead of counting on the ability to "shoot and scoot," opponents would have to assume that their forces are being hunted. In a situation when every stray electronic, seismic, or acoustic emission might be used to attack a TEL, missile crews might become preoccupied with the defensive task of protecting their missiles. They might not be able to fire with the "hunters" on their trail. Moreover, because it does not rely on "flaming datum"—an actual missile firing—to locate an opponent's weapon, an ASW--inspired strategy probably is the most effective approach to counterforce. It is the only strategy that suggests that it is possible to locate and to destroy missiles after they have moved to the field but before they can be fired.[8]

TMD as Joint Warfare

It is unlikely that any one service could successfully undertake all four elements—C^3I, active defenses, passive defense, and counterforce—embodied in theater missile defense. To succeed, an ASW approach to TMD would have to draw on the resources available within the entire US defense and intelligence community. Indeed, the ASW approach to counterforce highlights the fact that TMD is primarily an exercise in peacetime intelligence gathering and analysis. Existing joint doctrine also acknowledges the important role played by national assets used by US Space Command (USSPACECOM), for example, in a joint TMD campaign.[9] An ASW approach, however, could help guide this peacetime collection and analysis by developing a highly specific set of intelligence requirements. New sensors also could be developed to facilitate day--to--day monitoring of potential opponents' mobile missile operations. Most importantly, work could begin to improve C^3I between national intelligence resources and the service components that will need real--time intelligence to engage in the hunt for mobile missiles.

US Strategic Command would be a good choice to head a TMD campaign. . . . In its former incarnation as the Strategic Air Command, STRATCOM also has much experience in planning massive multiservice air campaigns.

Each of the services also has a special role to play in an ASW approach to TMD. Air Force officers, given their expertise in the conduct of strategic bombardment, should be given responsibility for identifying and targeting the infrastructure that supports an opponent's mobile missile operations. To eliminate the possibility of sustained operations, the Air Force should work to destroy the logistical and industrial tail that supports an opponent's deployed missile force. Air Force experience in managing an overall air campaign also would suggest that it is the service of choice to tackle the C^3I and resource allocation problems inherent in a massive TMD effort.

Occasionally, [during the cold war] a service endorsed an idea advanced by another to capitalize on political interest in a war--winning strategy or capability, but this tactic often backfired. The Navy's grudging recognition of the importance of strategic bombardment during the B--36 debate . . . did not save its supercarrier.

Naval officers have more than just expertise in ASW operations to contribute to TMD. Unlike their Air Force counterparts, naval aviators tend not to think in terms of strategic bombardment, but in terms of destroying specific military targets. The Navy should be given the mission of destroying missiles that have already been deployed. Because the Navy's Aegis system will soon possess limited capabilities against ballistic missiles, a Navy carrier battle group also might serve as a sort of "emergency" TMD force. Naval aviation could conduct counterforce strikes against a few particularly threatening offensive systems while Aegis--equipped ships protect high--value coastal targets.

As the service operating the only demonstrated active defense—the Patriot missile system—against ballistic missiles, the Army has an obvious role to play in TMD. Others have been quick to identify the Army's Tactical Missile system, with a 40--kilometer range and antipersonnel/antimaterial submunitions, and the Apache attack helicopter, with a range in excess of 200 kilometers, as ideal counterforce weapons.[10] Less obvious, however, is the important role that ground forces play in an ASW approach to TMD. Ground forces, especially special forces, would prefer to exercise their ability to target and destroy installations and weapons deep behind enemy lines. But their greatest contribution to the TMD effort probably will take the less glamorous form of "policing the battlefield." In other words, ground forces will probably be required to conduct a whole host of operations after suspected missile sites have been subjected to attack. Small teams could guarantee that launchers and missiles damaged by air strikes were not just rendered temporarily inoperable by air attacks but were in fact destroyed. Primitive storage bunkers, difficult to identify from the air, might also be located by ground forces that quickly survey a damaged missile site. Most important, WMD warheads, already married to missiles or forward deployed near missile sites, will have to be secured. Even if launchers or missiles have been destroyed by air attack, operable warheads might still be used by an opponent or find their way onto the black market. US forces would also benefit from a quick assessment of the chemical or radioactive hazard created by damaged warheads following a successful counterforce attack.

Who should be in charge of a TMD campaign influenced by an ASW philosophy? Several considerations shape the answer to this question. First, TMD is largely a peacetime intelligence activity. Second, TMD requires continuous coordination of offensive and defensive capabilities possessed by all

the services. Third, the demand for TMD is not confined to a particular part of the globe. Regional CINCs must plan for TMD, but it might be more efficient if a separate command prepares TMD packages of multiservice C^3I, active defense, passive defense, and counterforce capabilities for insertion into a region.

Given these considerations, US Strategic Command (STRATCOM) would be a good choice to head a TMD campaign. STRATCOM's Project Silverbook, a peacetime effort to compile a TMD counterforce target list, could serve as an initial step in an ASW--inspired TMD strategy.[11] In its former incarnation as the Strategic Air Command, STRATCOM also has much experience in planning massive multiservice air campaigns which relied in part on real--time and national--level intelligence collection and analysis.[12] Alternately headed by Air Force and Naval officers, STRATCOM also brings together a unique combination of talents needed to make a TMD strategy based on ASW principles a reality: a history of planning joint counterforce attacks; an emphasis on large air operations; great familiarity with ASW; sustained intelligence gathering and real--time intelligence collection and assessment; a familiarity with special forces operations against WMD targets; and a tradition as the primary command for US nuclear operations.

Ideas and Joint Warfare

When applied to the problem of theater missile defense, an ASW philosophy provides a unifying idea that identifies goals and specifies tasks. It also supplies all concerned with an image of an entire process, based on extensive Navy experience, that can be used to evaluate how specific single--service initiatives might contribute to an overall TMD campaign. For those interested in fulfilling the scores of interrelated tasks identified in *Doctrine for Joint Theater Missile Defense*, the idea of ASW might supply a "point of departure": it specifies how one could begin to organize effective multiservice TMD with existing capabilities. In a sense, an ASW philosophy, borrowing a term from the philosophy of science, could serve as a *paradigm* for TMD: it identifies key problems that are in need of a solution, it specifies how one should proceed to overcome these key stumbling blocks, it allocates responsibility for solving specific parts of the problem, and it explains how the achievement of specific small tasks can produce a synergy that overcomes an extraordinarily complex problem.[13]

As a paradigm for TMD, however, antisubmarine warfare does suffer from a serious drawback: the term is forever linked to the Navy as one of its traditional, and quite important, mission areas. During the cold war, a suggestion that one service possessed the key to American security was likely to provoke an outburst of interservice rivalry. Occasionally, a service endorsed an idea advanced by another to capitalize on political interest in a war--winning strategy or capability, but this tactic often backfired. The Navy's grudging recognition of the importance of strategic bombardment during the B--36 debate, for example, did not save its supercarrier.[14] Thus, an ASW approach to TMD might be misconstrued as an effort to develop a single--service strategy, a strategy that purportedly allows one service to single-- handedly win the next war.[15]

It would be a mistake to under--estimate the impact of interservice and intraservice rivalry, despite renewed congressional emphasis on fostering joint responses to security threats.

Unlike single--service doctrines, however, an ASW philosophy is not an exclusionary paradigm. Much like the way the old maritime strategy organized all of the forces available to the Navy into a coherent campaign in the event of war along the Central Front, an ASW philosophy also allows each of the services to contribute what they do best to solving the problem of theater missile defense.[16] At its core, an ASW approach to TMD is a joint strategy: its central tenet is that only by working together can the services defend US allies or US forces stationed overseas from the mobile missile threat.

The fact that an idea originates in one service does not mean that it forever must be banished from the effort to foster joint strategy.

Still, it would be a mistake to underestimate the impact of interservice and intraservice rivalry, despite renewed congressional emphasis on fostering joint responses to security threats. STRATCOM's Project Silverbook, for instance, has been superseded by a new initiative, the Theater Planning Support Document. Project Silverbook was abandoned apparently after other CINCs objected to what they perceived as STRATCOM's effort to monopolize planning for counterforce strikes in support of TMD. At a time of shrinking or stable budgets, any effort to prompt a joint and, in this case, a potentially consolidated effort, is likely to meet with great resistance from some quarter of the defense establishment.

Conclusion

By adopting an ASW paradigm for TMD, the services would be embarking on a new form of joint warfare. Instead of reinventing the wheel, an idea used effectively by one service could be borrowed to address a complex multiservice problem. Indeed, breaking the taboo against borrowing ideas used by other services opens a whole range of possibilities. The danger always exists that some might choose to mimic blindly the capabilities possessed by other services, even though the size of post--cold--war defense budgets probably would greatly reduce the effectiveness of this budgetary tactic. But the fact that an idea originates in one service does not mean that it forever must be banished from the effort to foster joint strategy. □

Notes

1. Department of Defense, "Report on Nonproliferation and Counterproliferation Activities and Programs," (Washington, D.C.: Office of the Deputy Secretary of Defense, May 1994).

2. David Mosher and Raymond Hall, "The Clinton Plan for Theater Missile Defenses: Costs and Alternatives," *Arms Control Today* 24, no. 7 (September 1994): 15–20.

3. Kneale T. Marshall, "Quantifying Counterforce and Active Defense in Countering Theater Ballistic Missiles," *Military Operations Research* 1, no. 2 (Winter 1994): 35--48; and Warner Schilling, "U.S. Strategic Concepts in the 1970s: The Search for Sufficiently Equivalent Countervailing Parity," *International Security* 6, no. 2 (Fall 1981): 67–68.

4. The Clinton administration counterproliferation and TMD policies have raised much debate. Some analysts are concerned about the issues of preemption and preventive war raised by counterforce strategies. See David C. Hendrickson, "The Recovery of Internationalism," *Foreign Affairs* 73, no. 5 (September/October 1994): 34–38. Others are concerned that TMD and the 20--year--old Anti--Ballistic Missile Treaty are on a collision course: active defense systems under development have capabilities that are apparently in violation of treaty provisions. See Guy B. Roberts, "An Elegant Irrelevance: The Anti--Ballistic Missile Treaty in the New World Disorder," *Strategic Review* 23, no. 2 (Spring 1995): 15–25. Those who champion more traditional nonproliferation strategies—for instance, those associated with the Nonproliferation Treaty—believe that counterproliferation generally undermines their efforts to reduce states' incentives to acquire WMD and associated delivery systems. See Leonard S. Spector, "Neo--Nonproliferation," *Survival* 37, no. 1 (Spring 1995): 66–85. Others believe TMD will bolster traditional nonproliferation efforts by further reducing states' incentives to acquire and deploy WMD. See Jonathan Sears,

"The Northeast Asia Nuclear Threat," US Naval Institute *Proceedings* 121, no. 7 (July 1995): 43–46.

5. Joint Publication (JP) 3--01.5, *Doctrine for Joint Theater Missile Defense*, 30 March 1994, 1–2.

6. Many successful wartime innovations—for example, carrier aviation and the development of a US Marine Corps amphibious capability—experienced a long peacetime gestation. Paradoxically, effective wartime innovation is facilitated by prior planning. See Stephen Rosen, *Winning the Next War: Innovation and the Modern Military* (Ithaca, N.Y.: Cornell University Press, 1991), 76–85.

7. As part of the secret agreement ending the Cuban missile crisis, the Kennedy administration requested that the United Nations inspect Cuba to insure that the Soviets had eliminated their WMD capability from the island. Castro, however, never granted permission for the inspections. See Raymond L. Garthoff, *Reflections on the Cuban Missile Crisis* (Washington, D.C.: The Brookings Institution, 1989), 123.

8. For a discussion of the strategic and political benefits provided by this tactical advantage, see James J. Wirtz, *Counterforce and Theater Missile Defense: Can the Army Use an ASW Approach to the Scud--hunt?* (Carlisle Barracks, Pa.: Strategic Studies Institute, US Army War College, March 1995).

9. "US forces that are part of multinational commands will normally be supported by national intelligence systems to augment their organic intelligence systems." JP 3--01.5, II--10 and III--11.

10. John Gordon, "An Army Perspective of Theater Missile Defense," US Naval Institute *Proceedings* 121, no. 7 (July 1995): 40–43.

11. Barbara Starr, "STRATCOM sees new role in WMD targeting," *Jane's Defence Weekly* (14 January 1995), 3.

12. For a description of some of these activities, see Ashton B. Carter, John D. Steinbruner, and Charles A. Zraket, *Managing Nuclear Operations* (Washington, D.C.: The Brookings Institution, 1987), 217–352.

13. For a complete explanation of the term *paradigm*, see Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962). For a recent effort to apply the notion of paradigm to explain change in military organizations, see Rosen.

14. Michael Palmer, *Origins of the Maritime Strategy* (Washington, D.C.: Naval Historical Center, 1988), 44–52.

15. For a discussion of these "nonstrategies," See Edward Luttwak, *Strategy: The Logic of War and Peace* (Cambridge: Harvard University Press, 1987), 156–74.

16. For a description of the maritime strategy, see Linton Brooks, "Naval Power and National Security: The Case for the Maritime Strategy," *International Security* 11, no. 4 (Fall 1986): 58–88.

A COMMENTARY

DR. RONALD J. KURTH

JAMES J. WIRTZ'S article "A Joint Idea: An Antisubmarine Warfare Approach to Theater Missile Defense" offers a concept for organizing the solution to a growing problem in military operations: defense against theater missiles. That concept is Navy doctrine for antisubmarine warfare (ASW). The basic problem for the Navy in ASW involves the reduction of a suspected target location in a vast ocean area to a localized datum with sufficient criteria to warrant an attack. An ASW unit seldom sees the submarine it attacks. Most often, sound—through active or passive means—is electronically converted to a fix on the target, offering a combination of bearing and distance. Augmenting information may be present—magnetic anomaly detection, for example. In his article, Wirtz assumes that defense against theater missiles is similar to defense against submarines.

The difference in the "battlefield" environment of a submarine and a transporter--erector--launcher (TEL) is immense. ASW surveillance and prosecution operations in peacetime have the important advantage of the principle in international law of freedom of the seas. Furthermore, submarine operations are naval operations of a special kind: they are always secretive and never admitted, and are not responsive to schemes for a control regime that has been basically impossible. Consequently, US naval forces could practice localization procedures in peacetime—against Russian submarines, for example—and not hear much about it. ("Incidents at sea" experience is relevant here.) No

such freedom exists for gaining similar experience in theater missile defense (TMD).

The contrast in wartime for airborne operations in ASW and TMD is even more stark. An ASW aircraft flies over open--ocean areas during submarine search operations with little fear that a lurking submarine can threaten it. Nor does the aircraft normally violate any sovereign territory during its search. The competition between hunter and hunted normally occurs in and over the vast but open and accessible ocean areas. Searching over defended land areas for TELs is a more difficult endeavor.

A locatable object must exhibit characteristics that allow the seeker to differentiate it from its surroundings. The submarine is foreign to its operational environment. As a result, acoustic ASW has many characteristics to exploit—so many that the submarine can be detected when ambient noise exceeds the submarine--generated sounds by orders of magnitude. The cycle leading to this result is straightforward. After scientists identified sound as a potentially exploitable characteristic, they designed equipment to enhance the desired differentiation. At sea, testing established the optimal use of the equipment. Lessons learned at sea became the genesis of a better definition of the exploitable and/or the building of improved equipment, allowing the cycle to perpetuate.

Could we search for TELs in any way comparable to open--ocean ASW operations? . . . I don't know.

One should consider other major differences. Technology advanced to make submarines less discoverable, but the march of technology in ASW tended to match progress in submarine development. I do not see developments in TMD comparable to the developments in theater missiles. It *did* take years to cope with the advances in propulsion and secretiveness offered by nuclear power, but ASW advances occurred. They did so principally because submarines in an open--search environment retain characteristics that make them discoverable: they make noise, their screws cavitate, and their machinery has identifiable frequency characteristics. They generate heat, ocean disturbances, and magnetic anomalies.

What are comparable characteristics of TELs? Except when firing, they are quiet. Furthermore, they are mobile and easily hidden from air and satellite search. Could we search for TELs in any way comparable to open--ocean ASW operations? Can space--based platforms do it? I don't know. As I mentioned earlier, submarines at sea do not fight *airborne* ASW units, although they may fight surface and submarine ASW units. But ASW operations can be integrated in all three regimes. TMD is still in its infancy in terms of multiregime attack.

The natural state of all objects (man--made or natural) on land is to be at rest on the ground. Many objects share characteristics with TELs, including weight, size, shape, composition, color, density, temperature, and so forth. Differentiation (presumably at some distance) is problematic because the hidden TEL shares the same natural states as its surroundings. When in motion, the TEL is easier to locate because it is in an unnatural state. After launch, a missile is foreign to its environment and easily detected. A missile in flight currently may be the most—possibly the only—exploitable characteristic leading to a high probability of locating a hidden TEL. The several implications are obvious.

Do I sense in Wirtz's article another example of the Gulf War syndrome: open areas, desert, air superiority easily established, small area, the opponent's relatively backward technology? What if we were looking for TELs in China (vast), Japan (advanced), Vietnam (jungle), Yugoslavia (rugged and covered), and Russia (vast, maybe advanced, and masters of cover)? How would we exercise to assure ourselves of capability? And

when would we begin overflight, which could be an act of war? Further, the concepts of special operations presented by Wirtz, I think, are naive. How many times could we put teams into remote, hostile territory for the same mission? I'd go on the first but not the 10th. Decoys and *maskirovka* would be rather easy.

The discussion of exploiting characteristics of submarines or other things requires consideration of the nature of each characteristic. Some are continuous; some are persistent. All have ranges at which detection becomes difficult. One ideal for ASW is a continuous, nonpersistent (i.e., it doesn't remain after the submarine has passed—unlike a tire track in the mud after a land vehicle has passed) noise source of constant frequency. Exploiting this type of sound required the development of specialized equipment and techniques. Prosecuting other types of energy (acoustic and other) released into the water by a submarine necessitated different equipment and tactics. The nature of the telltale characteristic is critical to the development of the technology to locate a submarine (or a TEL). If the nature of the telltale characteristic for locating a TEL is similar to the nature of one or more acoustic characteristics of a submarine, the development of anti--TEL tactics may be analogous to the development of ASW. The bottom line is that this ASW concept may be worth pursuing for its value in integrating an all--source and all--defense concept. But if it becomes technologically feasible, destroying an incoming missile appears to be a much simpler concept. □

A COMMENTARY

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AS RONALD KURTH correctly notes in his response to James Wirtz's article "A Joint Idea: An Antisubmarine Warfare Approach to Theater Missile Defense," many tactical, strategic, and political differences exist between antisubmarine warfare (ASW) and locating and destroying deployed mobile transporter--erector--launchers (TEL). Wirtz's proposal does not reflect some fundamental failure to understand that undersea warfare is different than destroying TELs. Wirtz acknowledges that significant differences exist in applying an ASW approach to both kinds of operations. But Wirtz's point is that an ASW philosophy—a systematic process of analysis and organization of effort—can solve more problems than just finding submarines at sea.

Kurth acknowledges that an ASW approach to the Scud hunt might work, but he suggests that the differences in the two forms of warfare are too great to be bridged. Kurth's reservations center on four issues: (1) state sovereignty limits the possibility of conducting ASW--like operations over land in peacetime; (2) submarines do not shoot back at pursuing aircraft; (3) unlike TELs, submarines have many signatures that can be tracked; and (4) strategists should think of something other than repeating victory in the desert (i.e., the Gulf War syndrome). If these issues are resolved, however, Kurth apparently would be willing to endorse an ASW concept to guide development of an integrated, all--source theater missile defense architecture.

Kurth's first reservation is important: we cannot use overt surveillance involving penetration of a potential opponent's airspace to track TELs on a day--to--day basis. But conducting these kinds of intrusive operations is not necessary during peacetime. Instead, intelligence analysts can monitor launcher storage areas to estimate the opponent's order of battle and mobilization procedures. Clandestine, autonomous unmanned air or land vehicles or space--based assets might also watch choke points (e.g., highways or bridges). We might also use existing or specially developed space--based area search sensors to conduct continuous monitoring to detect potential targets. These systems may only be queuing platforms, or they may be capable of providing a near--real--time datum to a platform capable of target localization, classification, and destruction. The National Command Authorities can make the decision to shift to more aggressive operations, perhaps accompanied by appropriate measures against aircraft defenses, either during war or as hostilities appear imminent.

One might be tempted to respond to Kurth's second reservation—that submarines do not fire back at tracking aircraft—with the simple observation that TELs do not fire at attacking aircraft either. It is not clear that opponents will want to advertise the position of their TELs by placing them in easily identified, fortified areas. Opponents might adopt a "bastion" approach to protecting their TELs, much in the same way that the Soviets attempted to protect their fleet ballistic missile submarines during the cold war. But bastions did not stop American ASW efforts; air defenses might only complicate, but not limit, an ASW approach to hunting TELs. Creating heavily defended areas might even ease the more difficult task of determining the general location of missile launchers.

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Kurth's third reservation that submarines are inherently more observable underwater than TELs are on solid ground fails to acknowledge the variety of potential signatures generated by mobile missile launchers. (Kurth points out that the submarine is foreign to its environment—Admiral Rickover must be rolling over in his grave.) We should exploit all kinds of possible signatures, ranging from the obvious (infrared, electromagnetic, and acoustic) to the not so obvious (seismic, aural, and tire tracks), to hunt for TELs. As Kurth notes, TELs are different from nuclear submarines in that a nuclear--powered submarine does have a continuous, detectable signal source. A TEL's signal is analogous to that of a diesel submarine, which is available only when it is snorkeling and for only very short periods of time. But the TEL, like the diesel submarine, cannot run far from a datum.

Finally, is all of this just a reflection of the Gulf War syndrome? Apparently, Kurth fails to realize that the Scud hunt during Operation Desert Storm was unsuccessful. "Open areas, desert, air superiority . . . small area, the opponent's relatively backward technology" presented the American military with a problem that remains unresolved. Maybe TELs can be better hidden in the jungles of Vietnam or the hillsides of Yugoslavia; maybe rugged terrain and triple--level jungle canopy will hinder the positioning and movement of TELs. But the fact remains that Iraq demonstrated to a global audience that the United States is ill prepared to deal with the mobile--missile threat. An effective response to the deployment of TELs in desert

surroundings is as good a place as any to begin to solve the Scud problem.

During World War II, a group of scientists, mathematicians, and engineers defined methods and systematic processes of analysis that would lead to doctrines which would have widespread application, not only to ASW but also to many other military and civilian problems. To quote from that group of World War II analysts, "It is increasingly evident that no branch of the Service can afford anything less than maximum efficiency in the use of the men and materiel available to it. The realization of this ideal demands that the most advanced scientific knowledge available in the country be focused upon such matters not only in times of war, but especially in times of peace."[1] We have methods and systematic processes of analysis that work; let's adapt them and get on with the show. □

Note

1. Philip M. Morse, "Foreword," in Operations Evaluation Group, Report no. 56, "Search and Screening," 1946.